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Marketing Research Report No. 300

Costs of Marketing Appalachian Apples



U. S. DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service
Marketing Research Division

PREFACE

The data upon which this report is based were collected as part of an economic-engineering study of Appalachian apple packinghouses. The study is part of the Northeast regional project, NEM-19, "Handling Methods and Costs in Storing and Packing Apples." In this particular phase of the regional project, the Agricultural Marketing Service cooperated with West Virginia University in planning the study and conducting the field work.

Grower-packers in the Appalachian area cooperated wholeheartedly in permitting work-sampling observations and time studies to be made in their plants during the packing season and provided detailed information on overhead and operating costs. Professors Homer Evans and Ray S. Marsh of West Virginia University assisted in planning and implementing the study. John Porterfield, Pat McClintic, and Laurence Bettler, also of West Virginia University gave valuable assistance in collection of the data. The pictures were taken by David Creel of the West Virginia Agricultural Experiment Station.

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SUMMARY

Apple growers in the Appalachian area have been giving increased attention to raising the efficiency of their entire fresh market operation--all the way from the orchard through the packinghouse. They have made many changes in methods and equipment to lower costs and improve the quality of their apples, so that their apples can better compete with those from other parts of the country. The Department of Agriculture and the West Virginia Agricultural Experiment Station are cooperating in a regional research program to provide growers with the information they need to guide the changes they are making. This report presents labor requirements of 7 of the larger grower-packers as they were observed during the 1957-58 season. Costs were obtained by multiplying labor requirements by wage rates paid by the growers. The wide range in costs is due partially to the wide range in wage rates, since the laborers were not covered by minimum wage laws. The effects of different methods and types of equipment on costs and returns will be presented in later reports.

Some types of equipment and methods of performing specific jobs use more labor than do others. Each shed was packing a different variety, quality, and size of apple when the observations were made. Some were easier to pack than others. The labor requirements for each shed reflect these differences. Different packinghouses also used widely differing amounts of labor to perform similar jobs.

Crew organization and size of fruit were the chief factors determining labor requirements in packing consumer size bags. In some packinghouses, one person filled, weighed, and closed the bags, and placed them in cartons. In others, a different person performed each of these operations. Thus, in the latter packinghouses the balance of the crew was much more important, since too many people performing any one operation meant that they spent a part of their time waiting for work to do.

Only small apples are packed in consumer bags in these sheds. If the lot of fruit being packed ran mostly to larger sizes, the bagging crew had very few apples to pack.

Packinghouses in rural areas typically paid 50 cents per hour for most of their labor, while those in urban areas usually paid \$1.00 per hour. The higher wage rates were caused by competition for labor in those areas and not by differences in the efficiency of labor -- some of the most efficient packinghouses paid the lowest wage rates. The lower wage rates in rural areas were often counterbalanced, in part, by other benefits such as free housing, bonuses, and year-round employment. These costs could not be computed for inclusion in this analysis.

Labor costs varied substantially from one packinghouse to another as a result of the wide variations in both labor requirements and wage rates and the lack of any systematic relationship between the two. For example, the cost for stapling carton flaps ranged from 0.4 cent for a machine operation to 4.7 cents for a poorly-arranged hand operation. The average was 2 cents per carton.

Overhead costs -- including all items except labor and packing materials -- also varied greatly among packinghouses, partly because of differences in the age and kinds of equipment and buildings and partly because of variations in taxes, insurance, and utility rates between communities.

Total packinghouse costs averaged:

\$1.11 per tray-pack box
1.20 per Northwest box
1.13 per carton of twelve 4-pound bags
.93 per carton of nine 5-pound bags

Containers and packing materials comprised the largest group of costs; labor costs were the second largest component; and overhead costs were somewhat less.

Other marketing costs -- packinghouse selling costs, transportation, and wholesale commissions -- averaged 89 cents per unit for typical sales of tray-packs of U.S. Fancy Red Delicious in Philadelphia, leaving the grower-packer a net return for his fruit at his packinghouse door of \$2.57 per carton.

COSTS OF MARKETING APPALACHIAN APPLES

By Jules V. Powell and John K. Hanes, agricultural economists
Market Organization and Costs Branch
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INTRODUCTION

The Appalachian apple producing area consists of Pennsylvania, Maryland, West Virginia, and Virginia, but the production is concentrated in an area between Winchester, Va., and Chambersburg, Pa.

The Appalachian area, which ranks second to Washington State in the total volume of apples produced, is in a period of transition. If the area as a whole follows the same trend as the 4 principal apple producing counties of West Virginia, the number of apple orchards is decreasing, but the number of trees per orchard is increasing.^{1/} During the 1953-57 period, orchards with 5,000 or more trees in this area increased 44 percent while those with less than 5,000 trees declined 19 percent. Acreage devoted to apple orchards increased 5 percent.

In recent years over 50 percent of the Appalachian apple crop has been sold to processors. However, producers in the area are putting more emphasis on packing apples for fresh market. The growth of orchards in the area is associated with newer packinghouses and the gradual replacement of old packing and storage equipment. Two of the seven plants in the sample were new, and the owners of the older plants had plans for modernizing their present facilities.

Associated with these plans is increased emphasis on improved quality, better packages and containers, and more efficient marketing. With the production of new varieties and new sports of old varieties, the Appalachian area is producing apples of a color and quality comparable to apples produced in other areas. The location near large centers of population gives it an enviable competitive position in capturing a larger share of the fresh apple market.

Appalachian apple growers are interested in finding the most efficient methods and equipment in order to improve their competitive position in packing apples for the fresh market. This report presents the simple average costs of seven of the larger producers marketing apples with methods and types of equipment representative of the area. Later reports will analyze methods

^{1/} U.S. Agricultural Marketing Service and West Virginia Department of Agriculture. West Virginia Commercial Apple and Peach Survey, 1957. Federal-State Crop Reporting Service, Charleston, West Va., January 1958.

now in use in the Appalachian area and determine which are the more efficient. An attempt will be made to arrive at least-cost combinations of methods and equipment now available.

SAMPLE

The sample of packinghouses upon which this report is based was selected from a survey of 36 of the larger plants in the Appalachian area. Seven packinghouses were chosen to represent a cross section of the principal systems and methods of packing apples. Each of the seven plants packed a minimum of approximately 50,000 bushels of apples for fresh market each year. The plants selected provide a variety of conditions under which to compare costs. The types of containers packed and the methods and equipment used are representative of most types now in use in the Appalachian area.

PROCEDURE

Work sampling and time studies were made in each of the plants for approximately one week during the 1956-57 and 1957-58 seasons.^{2/} However, the labor requirements presented in this report are observed average times per tray-pack equivalent unit packed. (A tray-pack equivalent is 44 pounds of apples.) The time required for performing each operation, from receiving fruit to loading it out was measured. The time requirements are based on the total man-minutes used for a job, including idle time due to personal delay or machinery failure. Unit times were obtained by dividing total man-minutes by the number of containers packed during the time periods observed. Wide ranges in labor requirements between packinghouses are due largely to variations in the amount of idle time between plants. Effects of methods and types of equipment on labor requirements and costs will be analyzed in later reports.

Labor costs for each packinghouse were obtained by multiplying labor requirements by the wage rates quoted by packinghouse supervisors. Wide variations in labor costs between these Appalachian plants are due to both differences in labor requirements and wage rates, because, as in most agricultural enterprises, none of the labor is covered by minimum wage laws.^{3/}

For purposes of computation, it was assumed that the tray pack and Northwest box contained a net weight of 44 pounds of apples. Cartons of twelve 4-pound bags and nine 5-pound bags contained 49 and 46 pounds of apples, respectively. Costs for other types of containers are not considered in this report.

^{2/} For a report of costs during the 1956-57 season see "Costs and Mechanical Injury in Handling and Packing Apples" by Homer C. Evans and Ray S. Marsh, W. Va. Agr. Expt. Sta., Bul. 416, June 1958.

^{3/} Under the Fair Labor Standards Act, the agricultural workers covered in this report are exempt from the minimum wage requirements (Title 29, Chapter 8, Fair Labor Standards, Section 213 (Exemptions), U. S. Dept. Labor).

Overhead and materials costs were obtained from owners and managers of the packinghouses at the end of the packing season. The original costs of the packinghouse and equipment were adjusted to the January 1958 price level.^{4/} Estimates of costs for repairs, heat, light, power, telephone, insurance, and taxes were used because these costs had to be allocated between packing and other operations, such as storage and general orchard operations. Estimated replacement costs of buildings were depreciated at 3.33 percent per year, and equipment depreciated at 10 percent per year. These were the average rates used by the packinghouses in the sample. Interest was computed at 3 percent of the 1958 value of building and equipment. This is equal to slightly over 5 percent of the undepreciated balance of these items. Per unit overhead costs were obtained by dividing total overhead costs for the year by the number of units packed during the season.

Marketing charges were determined from actual invoices of shipments of U.S. Fancy Red Delicious apples in tray packs and U.S. No. 1 Red Delicious apples in cartons of twelve 4-pound and nine 5-pound bags to specified cities. Average charges and packinghouse returns on shipments to Philadelphia, Pa., are shown in the concluding section of this report.

PACKINGHOUSE OPERATIONS AND COSTS

Packinghouse expenses are a major component of marketing charges in moving fresh apples from the farm to consumers. The average price of a carton of tray-packed U.S. Fancy Red Delicious Appalachian apples delivered to retail stores during the 1957-58 season was \$4.56. Packing costs accounted for almost \$1.11 or over 24 percent of the price delivered to retail stores. Average labor costs comprised over 22 percent, materials almost 57 percent and overhead expenses 21 percent of the total packinghouse charges.

Although there was great diversity in the types of equipment and the methods and procedures used in moving the fruit through the packinghouses, the same general steps were performed in all sheds. These processes are much the same for all fresh fruit packinghouses and have been described in detail in numerous publications. Briefly they are:

- (1) In some sheds, fruit was received from the orchards directly to the dumper in which case the field truck or trailer was more or less tied up waiting to be unloaded. This was particularly true during the early part of the season when the Red Delicious were being rushed to market. Some sheds received all of their fruit into storage. These sheds usually packed on order and supplied the dumper from

^{4/} Building costs were adjusted with the E. H. Boeckh and Associates Index of Construction Costs for Brick and Steel Commercial and Factory Buildings. Equipment costs were adjusted with the Bureau of Labor Statistics Index of Machinery and Equipment Costs.

storage by fork lift truck or conveyor belts.

- (2) Three ways of dumping fruit onto packing lines were observed. These were manually; straight-line, semi-automatic dumpers; and drum type automatic dumpers. Some sheds used automatic destackers with the drum type dumper (fig. 1).

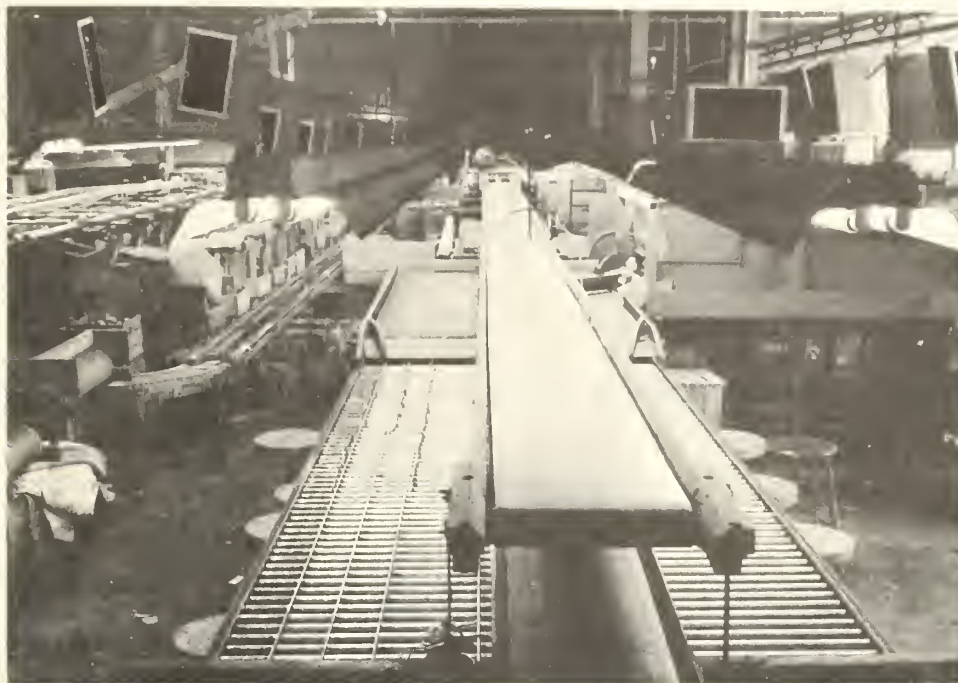


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Figure 1.--Automatic de-stacker sometimes used in conjunction with the drum type, automatic dumpers.

- (3) Disposal of the empty lugs after the fruit had been dumped was much the same in all sheds. The manual or automatic dumper deposited the empty lug on a conveyor belt which transported it elsewhere in the building to be nested and stacked.
- (4) After being dumped, the fruit usually passed through a series of brushes and onto a sorting table where 6 or 8 women sorted the fruit according to grade. Sorting tables were of 2 types: the float roll table and the spiral roll table. Most of the sheds sorted apples according to the State grades, which were Extra Fancy,

Fancy, Utility, and Cannery. Smaller apples for bagging were graded U.S. No. 1. Some of the sheds used U.S. grades, which are generally more strict than State grades. However, all of the sheds packed all grades during the season, depending on the variety of apple, the general quality of the lot being run, the time during the season, and market demand (fig. 2).



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Figure 2.--One type of sorting table used in the Appalachian area.

- (5) After being sorted by grade, the apples were conveyed to sizing equipment which sized them according to weight or dimension. Apples of the same size were accumulated in bins, in tubs, or on return flow belts to be packed.
- (6) All of the sheds included in this study were packing apples into tray packs, Northwest boxes, or master containers of 4-pound and 5-pound bags. The bushel basket is rapidly losing favor as a container for apples and the Northwest box is considered less desirable than the tray pack. Master containers of twelve 4-pound or nine 5-pound bags were very popular during the 1957-58 season. As with other operations observed in this sample of packinghouses, there was a diversity of methods of packing even where the same container was used. For example, some operators wrapped the top layer, while others wrapped none of the apples. One packinghouse in the sample used semi-automatic tray-packing equipment. In one plant, each packer performed all the operations in filling and closing the bags and

filling the master container and was paid by the number of master containers completed. In other packinghouses, the jobs of filling the bag, closing, placing it in the master carton, and closing the carton were all done by different people who were paid an hourly wage.

- (7) After the cartons or boxes were packed, they were transported to the lidding station where they were stapled or nailed. Stapling was done by either high speed, semi-automatic machines, or by hand. All of the nailing observed was performed by semi-automatic machines.
- (8) Cartons and boxes were usually stamped according to size and variety and tallied immediately before or after being lidded. The closed packages were then segregated by size, grade, and variety, stacked on pallets or placed on conveyors and moved to platforms or storage.
- (9) Other labor in the process of packing apples for fresh market usually did not handle the apples directly. These jobs consisted of assembling and supplying packing materials, supervising and clean up tasks.

PACKINGHOUSE LABOR

Labor Requirements

Packing and lidding are the only jobs in the process of preparing apples for fresh market for which labor requirements and costs would vary with the type of container being packed. All of the other operations would be the same regardless of the units of output.

In all sheds observed during this study, both tray packs or Northwest boxes were being packed simultaneously with master cartons of bags, or small apples were being eliminated from the conveyor to be bagged later.

Labor requirements for jobs other than packing and lidding ranged from 8.0 to 14.9 man-minutes and averaged 10.2 man-minutes per unit of output (table 9).

Packing and lidding cartons of tray-packed apples ranged from 3.6 to 9.2 man-minutes and averaged 5.5 man-minutes per tray pack produced. Thus, total average labor requirements per unit of tray pack produced in the 7 sheds approximated 15.8 man-minutes (table 1). Similarly, average labor requirements to pack and lid the Northwest box averaged 7.1 man-minutes and all packinghouse labor totaled an average of 17.9 man-minutes per unit (table 2). Comparable figures for master containers of 4- and 5-pound polyethylene bags are 21.6 and 15.6 man-minutes, respectively, per master container of bags produced (table 3). It is interesting to note that a 5-pound polyethylene bag can be filled as quickly as a 4-pound bag. The difference in time requirements per master container is due to the fact that there are 3 more of the 4-pound bags to be placed.

Table 1.--Total labor requirements for tray packing apples manually for fresh market, 7 packinghouses, Appalachian area, 1957

Item	Packinghouse							
	A	B	C	D	E	F	G	Average
	Man- minutes	Man- minutes	Man- minutes	Man- minutes	Man- minutes	Man- minutes	Man- minutes	Man- minutes
General labor...	8.55	7.99	11.53	14.95	9.02	9.61	10.32	10.29
Packing.....	4.11	3.23	5.07	7.79	5.05	4.19	3.94	4.77
Lidding.....	.40	.32	1.67	1.43	.58	.41	.56	.77
Total....	13.06	11.54	18.27	24.17	14.65	14.24	14.82	15.83

Table 2.--Total labor requirements for packing apples in Northwest boxes, 4 packinghouses, Appalachian area, 1957

Item	Packinghouse				
	A	D	F	G	Average
	Man- minutes	Man- minutes	Man- minutes	Man- minutes	Man- minutes
General labor....	8.55	14.94	9.37	10.31	10.79
Packing.....	5.16	11.56	3.18	5.22	6.28
Lidding.....	.23	2.28	.41	.34	.82
Total.....	13.94	28.78	12.96	15.87	17.89

Table 3.--Total labor requirements for packing master cartons of twelve 4-pound and nine 5-pound bags of apples, 4 packinghouses, Appalachian area, 1957

Twelve 4-pound bags						
Item	Packinghouse					Average
	A	C	D	G		
	Man- minutes	Man- minutes	Man- minutes	Man- minutes	Man- minutes	
General labor...	8.55	11.56	14.94	10.31	11.34	
Packing.....	8.59	8.89	10.87	7.25	8.90	
Lidding.....	3.14	.75	1.43	.19	1.38	
Total.....	20.28	21.20	27.24	17.75	21.62	
Nine 5-pound bags						
	Packinghouse					Average
	B	E	F	G		
	Man- minutes	Man- minutes	Man- minutes	Man- minutes	Man- minutes	
General labor...	7.99	9.02	9.37	10.31	9.17	
Packing.....	4.61	7.90	5.12	5.88	5.88	
Lidding.....	.92	.58	.67	.19	.59	
Total.....	13.52	17.50	15.16	16.38	15.64	

Net labor requirements using work sampling data and deleting time lost in waiting for fruit, personal delays, machinery failures, etc., will be presented in a later report. However, the foregoing labor requirements approximate what Appalachian apple packers are using under their present systems of operation and provided basis from which packing costs were developed.

Wage Rates

Wage rates paid in the Appalachian apple packinghouses vary widely through out the area. One of the primary factors in determining the level of wages grower-packers paid was the location of the packinghouse. Those located in populated areas where they had to compete with year-round industries for labor usually paid higher wages than grower-operated packinghouses in rural areas. Another factor that affected the level of wages paid in these rural packinghouses was that most of the women doing the packing and grading were wives

or daughters of men who had year-round jobs in the orchards and worked in the packinghouses only during the packing season. These orchard employees and their families usually occupied homes near the orchards which were supplied to them free or at a very low rent. Annual bonuses and other incentives were often coupled with this close employer-employee relationship. Because of the many intangibles of these arrangements, free housing, bonuses and other labor incentives were excluded from these computations. The packing costs presented herein are simply the labor requirements multiplied by the wage rates for each job as quoted by packinghouse managers.

Wage rates in the packinghouses studied for sorters, who were almost invariably women, ranged from 50 cents in rural areas to \$1 per hour in urban areas. Men usually were paid 10 cents more per hour than women. Some sheds paid packers on a piece rate basis which was usually 10 cents per tray pack or Northwest box, and 12 cents per master carton of bags. For comparability, all supervisory personnel were allocated a wage rate of \$2.50 per hour, which is approximately the average for the area.

Labor Costs

During the 1957-58 season, general labor costs in the 7 grower-operated packinghouses averaged 15.6 cents per tray-pack equivalent unit of packed fruit. They ranged from a low of 10.6 cents to a high of 20.2 cents. Sorting the fruit was the largest single component of general labor costs, ranging from 1.4 cents to 7.8 cents and averaging 3.7 cents per unit packed. On the average, supplying the dumper, dumping, and stacking empty lugs were the smallest cost components of general labor costs, averaging approximately .7 cent each per unit of packed fruit. Detailed general labor costs are shown in table 10.

Costs of packing tray-pack cartons ranged from 3.8 to 11 cents and averaged 7.5 cents per unit. Packinghouses A, F, and G paid rates of 10 or 11 cents per tray pack (table 4). When compared with other packinghouses that paid their packers an hourly rate, it appears that these packers were not producing at an optimum rate. Packinghouse D, which had the highest labor requirements for tray-pack cartons (but paid packers 55 cents per hour) had considerably lower costs than those paying by the carton.

Lidding the tray pack cartons averaged 1.0 cent per carton, ranging from a low of 0.4 cent to a high of 2.2 cents. Total costs for packing and lidding tray packs ranged from 4.2 to 11.7 cents per carton and averaged 8.5 cents per unit of output. Total general labor, packing, and lidding costs averaged 24.2 cents per unit of tray-pack apples produced in the seven sheds.

Only one of the four packinghouses that packed the Northwest box paid packers an hourly wage rate. The other three paid 10 or 11 cents per unit of output. However, packing labor costs in all four sheds are similar varying from 10 to 11 cents and averaging 10.4 cents per unit. Lidding costs varied widely, ranging from 0.3 to 2.7 cents per unit and averaging 1.1 cents per Northwest box. Total general, packing, and lidding labor costs for the four sheds averaged 28.1 cents per Northwest box packed (table 5).

Table 4.--Average labor costs in tray packing apples manually for fresh market, 7 packinghouses, Appalachian area, 1957

Item	Packinghouse							Average
	A	B	C	D	E	F	G	
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
General labor:	13.79	12.18	20.17	18.58	10.58	16.89	17.20	15.62
Packing.....:	10.00	3.77	6.33	7.14	4.21	11.00	10.00	7.49
Lidding.....:	.60	.43	2.23	1.67	.73	.68	.90	1.03
Total...:	24.39	16.38	28.73	27.39	15.52	28.57	28.10	24.14

Table 5.--Average labor costs in packing apples in Northwest boxes for fresh market, 4 packinghouses, Appalachian area, 1957

Item	Packinghouse				Average
	A	D	F	G	
	Cents	Cents	Cents	Cents	Cents
General labor...:	13.79	18.58	16.89	17.20	16.62
Packing.....:	10.00	10.60	11.00	10.00	10.40
Lidding.....:	.34	2.66	.68	.63	1.08
Total.....:	24.13	31.84	28.57	27.83	28.10

Four of the packinghouses packed master cartons of twelve 4-pound bags during the period of observation. Labor costs of filling, weighing, and closing the bags ranged from 10.0 to 12.9 cents and averaged 11.5 cents per carton of bags. Lidding costs for stapling the carton flaps ranged from .4 cent (a machine operation) to 4.7 cents (a poorly arranged hand operation) and averaged 2.0 cents per carton. Total packing and lidding costs per completed carton averaged 13.4 cents. Average general labor cost in these four packinghouses was 17.4 cents. Thus the total packinghouse labor cost per carton of twelve 4-pound bags averaged 30.9 cents.

Four packinghouses packed master cartons of nine 5-pound bags during the period of observation. Only one of these also packed cartons of twelve 4-pound bags and is included in the data for that operation. Labor costs for filling, weighing, and closing nine 5-pound polyethylene bags averaged 8.2 cents ranging from 5.5 to 12 cents per filled carton. The high of 12 cents

was due to the piece rate paid for this operation. Cost of lidding the master carton ranged from 0.4 cent to 1.2 cents and averaged 0.8 cent per container. It is doubtful if there is any difference in labor requirements or costs between lidding the master containers for 4- or 5-pound bags. The wide difference in labor costs disclosed in these data is due to differences in methods and efficiencies between sheds. Only one shed was observed packing both the 4-pound and 5-pound bags; the remaining sheds in the sample packed one or the other.

Total packing and lidding costs for master containers of nine 5-pound bags ranged from 6.8 to 12.4 cents and averaged 9.0 cents per container. General labor costs in the four sheds that packed the 5-pound polyethylene bags averaged 14.2 cents. Total packinghouse labor costs for master cartons of nine 5-pound bags averaged 23.2 cents per master container (table 6).

Table 6.--Average labor costs in packing apples in master cartons of twelve 4-pound and nine 5-pound polyethylene bags, 4 packinghouses, Appalachian area, 1957

Twelve 4-pound bags						
Item	Packinghouse					Average
	A	C	D	G		
	Cents	Cents	Cents	Cents	Cents	Cents
General labor....	13.79	20.17	18.58	17.20	17.43	17.43
Packing.....	12.90	11.10	9.96	12.00	11.49	11.49
Lidding.....	4.70	1.07	1.67	.35	1.95	1.95
Total.....	31.39	32.34	30.21	29.55	30.87	30.87
Nine 5-pound bags						
	Packinghouse					Average
	B	E	F	G		
	Cents	Cents	Cents	Cents	Cents	Cents
General labor....	12.18	10.58	16.89	17.20	14.21	14.21
Packing.....	5.53	6.58	8.53	12.00	8.16	8.16
Lidding.....	1.23	.68	1.12	.35	.85	.85
Total.....	18.94	17.84	26.54	29.55	23.22	23.22

MATERIAL COSTS

Costs of materials for packing apples were similar between sheds when similar weights, grades, and sizes of materials were considered. Apparent wide variations in costs of packing materials usually were due to differences in strength of the fiber board (heavy weights were used for storage), differences in the amount of printing and art work, and differences in size. In this analysis of packing costs, it was assumed that tray-pack units were made of 275 pound test fiber board, the average size of apple packed was size 100, and that none of the apples was wrapped. Costs of master containers for bags were the same regardless of the size of the bags to be packed in them. All sheds quoted similar prices for master containers, bags, and bag closures.

Costs of materials for tray-packing apples, including the carton, trays and pad, averaged 63.3 cents, ranging from 60.5 to 67.2 cents each. Costs for master cartons, twelve 4-pound bags, and bag closures ranged from 52.6 cents to 60.4 cents and averaged 55.2 cents per completed carton. Master cartons, bags and closures for nine 5-pound bags of apples averaged 47.6 cents. Packinghouses packing this particular container during the period of observation reported costs ranging from 45.5 to 48.8 cents per complete carton.

Materials costs for Northwest boxes (not included in the costs and returns sections that follows), averaged almost 70 cents per completed unit. These costs include the cost of the assembled box and lid, pads, and wraps for 100 apples.

OVERHEAD COSTS

Overhead costs include depreciation, taxes, interest, insurance, repairs on building and equipment, power, water, heat, social security, and workmen's compensation. Overhead expenses per unit of output were obtained by dividing total overhead expenses by the total units of tray-pack equivalents packed during the packing season. All overhead expenses were charged to the packed fruit, since it seems logical to assume that the packinghouse would be unnecessary if all fruit were sent to processors.

Overhead costs per tray-pack equivalent of output ranged from 14.6 to 33.6 cents and averaged 23.0 cents per unit. More detailed overhead costs are shown in table 11.

TOTAL PACKINGHOUSE COSTS

Total labor, materials, and overhead costs in packing apples in tray packs for fresh market averaged \$1.11 per container. Total costs ranged from \$0.92 to \$1.25 per tray-pack produced. Total costs for Northwest boxes averaged \$1.20.

Packing twelve 4-pound polyethylene bags in master containers cost an average of \$1.13 cents per container. This was slightly more than average total costs for tray packs, but the range was narrower--\$1.06 to \$1.18. Average costs for packing nine 5-pound bags into master cartons were lower than the other two types of packs considered here. Average cost per carton of nine 5-pound bags was \$0.93, ranging from \$0.82 to \$1.09 per container.

Costs of containers and packing materials were the most important components of total packing costs regardless of the type of pack produced. Labor costs were the second largest component of total costs, while overhead costs were least.

OTHER MARKETING CHARGES

Appalachian apples are marketed throughout the eastern part of the United States, in Europe, and in South America. However, the primary market areas are in the east and southeast. Each packer seems to sell the bulk of his apples in one particular market, where, over the years, he has built up satisfactory trade contacts and acceptance of his brand of apples.

Primary terminal market outlets were direct sales to chain stores with delivery to warehouses, and consignment to commission merchants. Each firm had some f.o.b. packinghouse sales, and one firm sold a large percentage of its packout through brokers in terminal markets.

In order to illustrate some of the other charges in marketing fresh Appalachian apples, invoices of shipments of U.S. Fancy Red Delicious in tray packs and U.S. No. 1 apples in master cartons of twelve 4-pound and nine 5-pound bags were obtained. The Red Delicious variety was selected for illustration because it was packed in relatively large quantities by each firm, and available price data were comparable between firms as to size, grade, and type of container. Philadelphia, Pennsylvania, was chosen as the destination for which marketing charges would be illustrated because it was one of the major cities to which all of the firms had shipped Red Delicious apples during the 1957-58 season.

Commission merchants usually charged 10 percent of their selling prices for handling the sale of apples in terminal markets. Charges averaged 46 cents per carton of tray-packs sold in Philadelphia. Average charges for master cartons of twelve 4-pound polyethylene bags were 42 cents; for nine 5-pound polyethylene bags, 36 cents.

The Appalachian area is advantageously located within overnight reach of some of the largest population centers of the country. Most of the Appalachian apples are transported to market in trucks within a few hours. Philadelphia, a major market for Appalachian apples, is less than 200 miles from most of the shippers in the area. However, transportation charges to that market comprise 13 percent of the total marketing charges for tray packs.

Transportation rates for 500-unit minimum trailer loads were obtained from rate schedules published by 2 of the trucking firms serving the area in which the 7 packinghouses are located. Transportation costs shown by packinghouse sales records were generally found to agree with the published rate schedules.

The cost per unit of tray packs or master cartons of bags for truck transportation from Winchester, Virginia, to Philadelphia, Pennsylvania, was 25 cents, plus 3 percent Federal tax. Transportation rates from Winchester to other major markets are shown in table 7.

Table 7.--Truck Transportation rates per bushel unit of apples, from Winchester, Va., to specified cities, 1957-58 season

Item	Atlanta	Baltimore	Philadelphia	Pittsburgh	Washington
	Cents	Cents	Cents	Cents	Cents
Transportation.....	50.00	15.00	25.00	25.00	12.00
Federal tax (3%).....	1.50	.45	.75	.75	.36
Total.....	51.50	15.45	25.75	25.75	12.36

Selling costs at shipping point are another important component of marketing charges for apples. Three general methods of sale were noted. One method was sale by the owner or hired salesmen, with costs of selling considered as an ordinary expense of the business. The second method was sale through a selling subsidiary of the packinghouse. This type of sales organization had a separate identity, but sold only fruit packed by the parent firm (or firms) and was allocated selling charges of 5 or 6 percent of the gross return. The third type was sales by independent selling brokers who made a flat charge ranging from 10 to 15 cents per unit sold. This type of agency sold all or a portion of the packout for a number of firms.

All of the 7 firms used one or more of the above methods of sale, depending on market conditions. Selling costs for tray packs ranged from 8 to 25 and averaged 17 cents per unit. Selling costs averaged 18 cents for master cartons of twelve 5-pound bags and 14 cents for cartons of nine 5-pound polyethylene bags.

Total marketing charges from the packinghouse receiving door to retail stores averaged \$2.00 for tray packs and master cartons of twelve 4-pound bags and \$1.69 for master cartons of nine 5-pound bags. Packinghouse and other marketing charges comprised 44 percent of the price of U.S. Fancy Red Delicious apples in tray packs delivered to retail stores. Similar percentages for U.S. No. 1 Red Delicious apples in master cartons were 45 percent for those containing twelve 4-pound bags and 47 percent for those with nine 5-

pound bags. The Red Delicious is usually the most popular fresh apple on the market. Since packinghouse and other marketing costs would vary little with the variety of apple, these costs probably comprise a larger percentage of delivered retail prices for lower priced varieties of apples.

PACKINGHOUSE RETURNS

Net returns to packinghouses were the actual cash returns after deducting charges for transportation, commissions, and selling expenses. Net returns per unit averaged \$3.68 for tray-packs, \$3.39 for master cartons of twelve 4-pound polyethylene bags and \$2.81 for containers of nine 5-pound bags (table 8).

Net value of fruit packed was the net return less the observed packinghouse expenses. Out of these returns, the grower-packers expect to be able to pay production costs, including returns to capital invested in orchard and orchard equipment, orchard labor, fertilizer, spray materials, and harvesting costs.

Net value of fruit packed in tray packs ranged from \$2.31 to \$2.81 and averaged \$2.57 per unit. U.S. No. 1 Red Delicious apples packed in master containers of twelve 4-pound bags ranged from \$2.05 to \$2.57, and averaged \$2.26 per carton. Similar apples in master cartons of nine 5-pound polyethylene bags averaged \$1.88 per carton.

Owing to quality differences, direct comparisons cannot be made between tray packs and master cartons. However, when net values per pound of fruit are compared it appears that a high proportion of U.S. Fancy, or better, fruit is a goal to be strived for by growers of the area. U.S. Fancy Red Delicious apples in tray packs averaged 5.8 cents per pound. U.S. No. 1 Red Delicious apples in 4- and 5-pound bags had average net values of 4.6 and 4.1 cents per pound, respectively (table 8).

This report has presented some average packing and marketing costs under present operating conditions for a sample of the larger packinghouses in the Appalachian area. These costs have been applied to prices growers receive f.o.b. packinghouse to arrive at a net value of the fruit packed. Reasons for variations in costs have not been analyzed. Later reports will attempt to point out how costs may be reduced through use of different methods and different types of equipment.

Table 8.--Average costs and returns from marketing U.S. Fancy Red Delicious apples, 7 Appalachian packinghouses, 1957-58 season 1/

Item	Traypack <u>2/</u>		Twelve 4-pound bags <u>2/</u>		Nine 5-pound bags <u>2/</u>	
	Dollars	Percent	Dollars	Percent	Dollars	Percent
Delivered price to Philadelphia <u>3/</u> retail store.....	4.56	100.0	4.25	100.0	3.56	100.0
Wholesale margin.....	.46	10.0	.43	10.0	.36	10.0
Transportation.....	.26	5.6	.26	6.1	.26	7.2
Gross return to packinghouse.....	3.85	84.4	3.57	83.9	2.95	82.8
Selling cost.....	.17	3.7	.18	4.1	.14	3.81
Net returns to packinghouse.....	3.68	80.7	3.39	79.8	2.81	79.0
Packing cost:						
Direct labor.....	.24	5.3	.31	7.3	.23	6.5
Packing material.....	.64	14.0	.56	13.2	.48	13.4
Overhead cost.....	.23	5.0	.26	6.0	.22	6.2
Total packing cost.....	1.11	24.3	1.13	26.5	.93	26.1
Net value of fruit packed:						
Per container.....	2.57	56.3	2.26	53.3	1.88	52.8
Per pound.....	.06		.05		.04	

1/ Discrepancies due to rounding.
2/ Tray pack, 44-pounds net; twelve 4-pound bags, 49-pounds net; nine 5-pound bags, 46-pounds net.
3/ Delivered price computed from gross return.

APPENDIX

Table 9.--Average general labor requirements per tray-pack equivalent unit of output in packing apples for fresh market, 7 packinghouses, Appalachian area, 1957

Item	Packinghouse							Average
	A	B	C	D	E	F	G	
	Man- minutes	Man- minutes	Man- minutes	Man- minutes	Man- minutes	Man- minutes	Man- minutes	Man- minutes
Supply dumper....	.21	.17	1.04	1.36	.67	.25	.15	.55
Dump.....	.21	.68	.57	.53	.43	.73	.15	.47
Stack empty lug.:	.29	.34	1.04	1.15	.42	.29	.34	.55
Grade.....	1.56	2.63	2.55	3.09	1.70	3.19	4.90	2.80
Stack packed fruit.....	1.07	.32	1.09	2.20	1.31	1.39	1.44	1.26
Crate cannery & cull apples....	.40	.78	1.04	2.30	.43	1.88	.41	1.04
Supply materials:	2.99	1.71	1.34	2.16	2.75	.96	1.71	1.95
Supervisory.....	.29	.68	1.56	1.44	.44	.92	.75	.87
Miscellaneous....	1.53	.68	1.30	.72	.87	--	.47	.80
Total.....	8.55	7.99	11.53	14.95	9.02	9.61	10.32	10.29

Table 10.--Average general labor costs per tray-pack equivalent unit of output in packing apples for fresh market, 7 packinghouses, Appalachian area, 1957

Item	Packinghouse							Average
	A	B	C	D	E	F	G	
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
Supply dumper.....	.32	.28	1.48	1.59	.84	.42	.28	.74
Dump.....	.32	.91	.81	.62	.55	1.21	.25	.67
Stack empty lugs..	.44	.46	1.48	1.34	.53	.49	.51	.75
Grade.....	2.34	3.07	3.19	2.83	1.42	5.32	7.75	3.70
Stack packed fruit.....	1.61	.43	1.50	2.20	1.64	1.90	1.17	1.64
Crate cannery & cull apples....	.61	1.10	1.48	2.69	.54	3.14	.41	1.42
Supply materials..	4.48	2.40	1.83	2.46	2.47	1.60	2.56	2.54
Supervisory...	1.21	2.40	6.08	3.95	1.82	2.81	2.45	2.96
Miscellaneous....	2.46	1.13	2.32	.90	.77	--	.82	1.20
Total.....	13.70	12.18	20.17	18.58	10.58	16.89	17.20	15.62

Table 11.--Average overhead costs per tray-pack equivalent unit of output in packing apples for fresh market, 7 Packinghouses, Appalachian area, 1957

Item	Packinghouse							Average
	A	B	C	D	E	F	G	
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
Depreciation:								
Building.....	4.29	3.75	3.85	6.56	2.07	2.95	1.71	3.60
Equipment.....	5.58	12.73	5.59	9.62	6.21	5.16	16.12	8.72
Taxes.....	.17	.47	.41	1.64	.44	.28	.32	.53
Interest.....	5.53	7.19	5.14	8.78	3.72	4.20	6.38	5.85
Insurance.....	.19	1.15	.96	--	.16	.20	1.84	.64
Repairs.....	.54	.45	.48	.98	.80	.41	.84	.64
Power.....	1.19	.24	.65	1.90	.66	.43	1.54	.94
Workmen's Comp...	.30	.42	.38	.89	.52	.35	.54	.49
Social Security..	.54	.77	.68	1.60	.93	.63	.98	.88
Miscellaneous....	.77	--	1.51	1.59	.88	--	.45	.66
Total.....	18.50	27.17	19.65	33.56	16.39	14.61	30.72	22.95

Table 12.--Average costs and returns per carton from marketing U.S. Fancy Red Delicious apples in tray packs, 7 Appalachian packinghouses, 1957-58 season 1/

Item	Packinghouse							Average
	A	B	C	D	E	F	G	
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Gross return to packinghouse...	3.84	3.97	4.10	3.71	3.67	3.95	3.70	3.85
Selling cost.....	.21	.21	.25	.15	.15	.08	.15	.17
Net return to packinghouse.....	3.73	3.76	3.85	3.56	3.52	3.86	3.56	3.68
Packing cost:								
Direct labor.....	.24	.16	.29	.27	.16	.29	.28	.24
Packing material.....	.66	.67	.61	.64	.60	.63	.65	.64
Overhead cost.....	.19	.27	.20	.34	.16	.15	.31	.23
Total packing cost.....	1.09	1.11	1.09	1.25	.92	1.06	1.23	1.11
Net Value of fruit packed:								
Per traypack.....	2.55	2.65	2.76	2.31	2.59	2.81	2.32	2.57
Per pound.....	.06	.06	.06	.05	.06	.06	.05	.06

1/ Discrepancies due to rounding.

Table 13.--Average costs and returns per carton from marketing U.S. No. 1 Red Delicious apples in master cartons of twelve 4-pound and nine 5-pound bags, 1957-58 season 1/

Item	Packinghouse					Average
	A	C	D	G		
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Gross return to packinghouse...	3.63	3.39	3.88	3.37	3.57	
Selling cost..	.21	.20	.15	.15	.18	
Net return to packinghouse...	3.42	3.18	3.73	3.22	3.39	
Packing cost:						
Direct labor..	.31	.32	.30	.30	.31	
Packing material.....	.60	.54	.53	.57	.56	
Overhead cost..	.19	.20	.34	.31	.26	
Total packing cost....	1.10	1.06	1.16	1.18	1.13	
Net value of fruit packed:						
Per tray pack..	2.32	2.12	2.57	2.05	2.26	
Per pound.....	.05	.04	.05	.04	.05	
	B	E	F	G	Average	
Gross return to packinghouse...	3.03	2.75	3.02	2.99	2.95	
Selling cost..	.16	.15	.08	.15	.14	
Net returns to packinghouse...	2.87	2.59	2.93	2.84	2.81	
Packing cost:						
Direct labor..	.19	.18	.27	.30	.23	
Packing material.....	.48	.48	.46	.49	.48	
Overhead cost..	.27	.16	.15	.31	.22	
Total packing cost....	.95	.82	.87	1.09	.93	
Net value of fruit packed:						
Per tray pack..	1.93	1.78	2.07	1.75	1.88	
Per pound.....	.04	.04	.05	.04	.04	

1/ Discrepancies due to rounding.



